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Global constraints on non-standard neutrino interactions with quarks and electrons

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We derive new constraints on effective four-fermion neutrino non-standard interactions with both quarks and electrons. This is done through the global analysis of neutrino oscillation data and measurements of coherent elastic neutrino-nucleus scattering (CEvNS) obtained with different nuclei. In doing so, we include not only the effects of new physics on neutrino propagation but also on the detection cross section in neutrino experiments which are sensitive to the new physics. We consider both vector and axial-vector neutral-current neutrino interactions and, for each case, we include simultaneously all allowed effective operators in flavour space. To this end, we use the most general parametrization for their Wilson coefficients under the assumption that their neutrino flavour structure is independent of the charged fermion participating in the interaction. The status of the LMA-D solution is assessed for the first time in the case of new interactions taking place simultaneously with up quarks, down quarks, and electrons. One of the main results of our work are the presently allowed regions for the effective combinations of non-standard neutrino couplings, relevant for long-baseline and atmospheric neutrino oscillation experiments.

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